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OVERABUNDANCE OF CARBON MONOXIDE IN CALORIMETRY TESTS*

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The amount of carbon monoxide recovered from calorimetry tests of high explosives is far larger than the amount predicted by equilibrium calculations. The pressure of detonation products within the bomb can range from about 30 GPa to one MPa, and the temperature ranges from about 3500 K to 298 K. The present kinetics study of PETN (nitro oxymethyl propanediol dinitrate) has revealed that the cooling of the calorimetry bomb after detonation of a PETN sample sufficiently slows those reactions which would lead to equilibrium so that these are effectively frozen in the time scale of recovery of detonation products. Among these reactions, those which can create CH_4 are the most important ones. Their slow rates are the main cause for the freeze-out of CO. A possible slow rate associated with formation of soot (i.e., condensed carbon) is not responsible for it. The sensitivity of the present result to the convective heat transfer coefficient of detonation products and to free radicals are also examined.

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